

# evolution of human needs in changing civilizations\*

by

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## I. introduction

The present study deals with the relationship between modernization and human needs. More specifically, the main theory is that, as technology advances and society becomes more modern, the greater satisfaction of physiological needs is accompanied by increasing emphasis on sociopsychological ones.

To test this theory, the author presents two types of data. First, a brief historical account of social welfare policies covers mental health conceptions and needs, family service agencies, definitions of, and reactions to, poverty, and the like. Second, a more circumscribed empirical investigation ascertains the nature of the work of various social agencies concerned with family needs in more recent times.

## II. the nature of human needs

There is still much confusion regarding the scientific terms, descriptions, typologies, and theories of man's multitudinous needs (Vernon, 1972:139). Sillamy (1967:44), for instance, has simply referred to a need as an «*état d'un individu par rapport à ce qui lui est nécessaire.*» Murray (1938:123-124), on the other hand, has formulated one of the most technical definitions of need, that is, a construct representing a force «in the brain region, a force which organizes perception, apperception, intellection, conation and action in such a way as to transform in a certain direction an existing, unsatisfying situation. A need is sometimes provoked directly by internal processes of a certain kind (viscerogenic, endocrinogenic, thalamicogenic) arising in the course of vital sequences, but, more frequently (when in a state of readiness) by the occurrence of one of a few commonly effective press... Each need is characteristically accompanied by a particular feeling or emotion and tends to use certain modes... to further its trend.»

Moreover, although many psychologists and others have employed the terms *need* and *drive* synonymously, the two have also been distinguished from each other. Indeed, unlike a drive, a concept borrowed from physics by Robert Woodworth (1918), a need «implies a more channeled impulse with a more articulated goal» (Theodorson and Theodorson, 1969: 272).

The countless and complex typologies of needs may be simplified and summarized as follows:

1. A *basic* or *primary need* is «one from which other needs are derived» or an innate need «determined by genetic factors» (English and English, 1965:

339). Erich Fromm's (1955: Chapter 3) famous classification of basic human needs is relatedness, transcendence, rootedness, identity, and a frame of orientation.

2. An *internal need* is that which «arises from changes within the organism, relatively independently of direct external stimulation» (English and English, 1965:339).

3. *External needs* refer to «the lack of some object or condition in the environment that would, if present, promote the biological or psychological efficiency of the organism» (English and English, 1965:339).

4. The goal of the so-called *stimulus needs* is not survival but «some kind of stimulation and particularly change in stimulation». Thus, these are of two subtypes, namely, a *need for sensory stimulation* and a *need for stimulus variability* (Kagan and Havemann, 1972: 339-344).

5. *Physiological needs* or drives «are regarded as persisting, organic motivations: conditions that arouse, sustain, and regulate human and animal behavior. Insofar as drives are based upon metabolic conditions they are common to all men in all societies and to many animals» (Young, 1968:275). These refer to survival and involve oxygen, water, proteins, vitamins, and the like.

When the physiological needs are satisfied, the organism is said to be in *homeostasis*, a term coined by Walter Cannon (Berkowitz, 1969:108-109). In addition, such primary drive reduction may be associated with related responses which are gradually reinforced and thus lead to the development of acquired secondary drives (Hull, 1943). Curt Richter (1943) has expanded the concept of homeostasis to include indirect physiological behavior that compensates for frustrated direct physiological processes (cf. O' Kelly, 1963). Some authors have gone even further than that, thus permitting homeostasis to encompass behavior aimed at maintaining social order and harmony.

6. *Sociopsychological needs* (for creativity, love, power, status, and the like), from Plato's *Republic* and *Laws* to Edward Thorndike's «law of effect» and David McClelland's measure of Murray's *n* Ach (McClelland *et al.*, 1953), have been subjected to much speculation and myriads of experiments. This partly explains the great number of «synonyms» employed with reference to such needs, namely, secondary motives or needs, derived needs, social needs, socio-genic needs, acquirable or learnable drives, acquired drives, and psychogenic drives or needs. According to Brown (1968:280), a need of this kind is one «that is a product of learning. In principle, animals as well as man can acquire drives, but man's opportunities for such learning during the process of socialization are held to be far more numerous, and the

complexity and diversity of his activities are thought more urgently to demand an acquired-drive interpretation.» Other authors have referred to such a need as one «learned by the individual through social interaction» (Theodorson and Theodorson, 1969: 272), or «a need growing out of the operation of primary needs but constituting a distinct motive in its own right» (English and English, 1965:339).

### III. history of mental health

Even a brief account of the history of man's attitudes toward and description of mental illness and health will easily afford some insight into the subject under consideration, that is, changing human needs in changing civilizations.

What seems to be the first description of a manic-depressive psychosis deals with Saul, the first king of Israel (1020-1000 B.C.), whose fluctuating emotions shortened his reign when the Philistines exploited his instability by attacking and defeating him at Mount Gilboa: «Therefore Saul took a sword, and fell upon it» (I Samuel 31:4). His suicide, as a form of behavior generated by mental illness, differed only in degree from his jealous treatment of David and even his own beloved son Jonathan, as well as his ruthless condemnation of witches and subsequent necromantic dealings with the witch of Endor (I Samuel 28:7-20). The biblical descriptions of his manic and depressive states are revealing: «Saul said, Let us go down after the Philistines by night, and spoil them until the morning light, and let us not leave a man of them» (I Samuel 14:36); and «it came to pass, when the evil spirit from God was upon Saul, and David took an harp, and played with his hand» (I Samuel 16:23). It is no wonder, then, that such heights of boundless enthusiasm and depths of incapacitating depression inspired Browning's poem, Handel's oratorio, and Rembrandt's portrait.

Five centuries later, Hippocrates of Cos (460-377 B.C.), the so-called father of medicine, developed a naturalistic theory of mental illness. Indeed, in his *The Sacred Disease*, which deals with epilepsy, he attacks all demonic etiology and, instead, speaks of neurohumoral causes: «In my opinion, those who first attributed a sacred cause to this illness were like today's magicians, purifiers, and mountebanks» (II, 1-4).

Plato (427-347 B.C.) mentioned three causes of mental illness, that is, somatic, sociocultural, and supernatural (*Laws*, 934a-e; *Phaedrus*, 245b-c; *Republic*, 573a-d).

Galen of Pergamum (129-199 A.D.), the court physician of Marcus Aurelius, often viewed brain disorders as the main causes of mental illness.

It is surprising, then, that as late as the 16th cen-

tury, especially in Germany, even scholars dealt with the etiology of mental illness as if the only diagnostic method were: «*Cherchez le diable.*» But now, a modern trend begins to reflect and influence the emergence of a new emphasis on man's sociopsychological needs. Johannes Weyer (1518-1588), for instance, the Protestant physician to Duke William of Cleves and so-called «first psychiatrist,» published his celebrated *De Praestigis Daemonum*, in 1563, and *De Lamis*, in 1577. Weyer, although he believed in the existence of Satan, attacked most vigorously the witchcraft theory of mental aberrations and asserted that the physician, not the priest, must treat such problems.

In the New World, in early Colonial times, this trend manifested itself in communal efforts to deal with physiological and sociopsychological needs less supernaturalistically and more realistically and objectively (Deutsch, 1949:47-48; Friedlander, 1961:78-79; Greenblatt, 1957).

Thus, in 1729, after a smallpox epidemic, the Ursuline Sisters founded an orphanage for the survivors in New Orleans.

More revolutionary was the famous Pennsylvania Hospital, which Benjamin Franklin supported in 1750 with his brilliant statement concerning the definition of a specific cause of dependency and the specialized services which should be offered. This original philosophy included a central agency, competent physicians, the newest medical methods, and the conviction that the patients should be returned to their homes and work as soon as possible, which, as Franklin averred, would benefit both the poor and the taxpayers. It is further significant that this plan also stressed continuous medical research in this area. It is not surprising that, with Franklin behind this system, many cities became eager imitators.

The first publicly financed hospital for the mentally ill in the Colonies was authorized by the Virginia legislature in 1769.

Among the many later forces that influenced the definition and treatment of mental illness were Richard von Krafft-Ebing's *Psychopathia Sexualis* (1865), which appeared in 1886 and stressed disorders of the central nervous system, and Sigmund Freud's (1856-1939) theory of psychoanalysis (Brill, 1938).

In the United States, an important step was taken in 1946, when the National Mental Health Act was passed. This act, which defined mental illness as a major social problem, was partly inspired by Albert Deutsch's work. Three years later, Deutsch published his *The Mentally Ill in America*, which influenced both the public and legislators, and ultimately led to the development of the National Institute of Mental Health.

Among the additional measures that were adopted

to support mental health programs after the National Mental Health Act of 1946 were the following:

1. Mental Health Study Act of 1955.
2. Maternal and Child Health and Mental Retardation Planning Amendments to the Social Security Act (1963).
3. Mental Retardation Facilities and Community Mental Health Centers Construction Act (1963).
4. Mental Retardation Facilities and Community Mental Health Centers Construction Amendments (1965).
5. The Mental Health Amendments of 1967.

The National Institute of Mental Health itself has introduced various innovations to improve therapy, including the Hospital Improvement Program and the Hospital Staff Development Program. For the mental health personnel's training alone, the institute has expended the following sums of money:

| Year | Millions of Dollars |
|------|---------------------|
| 1948 | 1.1                 |
| 1950 | 3.1                 |
| 1952 | 4.2                 |
| 1955 | 4.6                 |
| 1960 | 22.9                |
| 1965 | 73.2                |
| 1969 | 109.0               |

At the present time, some of the most important scientific models dealing with mental health are as follows (Margolis and Favazza, 1971:775-780):

1. Medical model.
2. Sociocultural development model.
3. Behavioral model.
4. Psychodynamic model.
5. Community psychiatry-public health-community mental health model.
6. General systems model.

In brief, it seems that, as science and technology advance and our physiological needs reach higher levels of satisfaction, we tend to become more aware of our sociopsychological needs, thus emphasizing their increasingly scientific definition, description, and etiology, and also expending more funds for the professional training of mental health specialists, as well as for the greater satisfaction of such nonphysical needs (Holden, 1972). Moreover, the public itself appears to regard this form of satisfaction as an inalienable right.

#### IV. family service agencies

This trend can be seen more clearly in the recent development of social agencies concerned with family needs.

Indeed, the Charity Organization Societies of the late 19th century, which were similar to various

English organizations, emphasized relief and charity for the poor, since private efforts in this sphere were inadequate.

In 1911, however, the Charity Organization Societies formed the National Association of Societies for Organizing Charity, which included 62 societies. The new philosophy stressed nutrition, health, welfare, the money payment principle, helping the individual to help himself, education, family counseling by volunteers known as «friendly visitors,» social reforms, and prevention.

Eight years later, the association changed its name to American Association for Organizing Family Social Work, thus expressing the gradual shift from community organization to family services (Fink, 1942).

About 1920, as Mary Richard's *Social Diagnosis* had already indicated in 1917, increasing emphasis was placed on the worth and dignity of the individual and on his sociopsychological needs. But this emphasis was rather limited, and it diminished further when the depression years brought unemployment and intensified the physiological needs of the masses (Booz, 1967).

Then, in 1935, the Social Security Act introduced the concept of governmental responsibility for the basic needs of the family.

The Barden-La Follette Act of 1943 dealt with vocational rehabilitation, stressing both physical and sociopsychological aspects.

Finally, after World War II, the new prosperity, the higher standard of living, the rising life span, and the expansion of the middle classes encouraged greater concern for man's sociopsychological needs (Family Service Association of America, 1968; Brooks, 1972:387).

Once more, then, this brief history of family service agencies reveals the inverse relationship between physiological and sociopsychological human needs.

#### V. poverty

This relationship may be further explored by examining poverty, which is usually accompanied by a limited satisfaction of physiological needs.

In the United States, the percent distribution of families for high and low income levels was as follows between 1947 and 1969 (United States Bureau, of the Census, 1971:316):

| Year | Under \$1,000 | \$15,000 and over |
|------|---------------|-------------------|
| 1947 | 10.8          | 2.7               |
| 1950 | 11.5          | 3.3               |
| 1955 | 7.7           | 1.4               |
| 1960 | 5.0           | 3.7               |
| 1965 | 2.9           | 7.6               |
| 1968 | 1.8           | 14.7              |
| 1969 | 1.6           | 19.2              |

One may also employ the poverty index method, the common form of which is that developed by Mollie Orshansky (1965). This index is equal to the food budget times 3. Thus, in 1969, for an average nonfarm family consisting of four members, the minimum income was fixed at \$3,743 per year, or \$2.56 per person, per diem. Of course, the corresponding poverty index for the farm family was 15 percent lower, since this type of family grew much of its own food. The poverty indices for various family sizes were as follows:

| Family Members | Poverty Indices |
|----------------|-----------------|
| 1              | 1,840           |
| 2              | 2,383           |
| 3              | 2,924           |
| 4              | 3,743           |
| 5              | 4,415           |
| 6              | 4,958           |
| 7 or more      | 6,101           |

This means that about 24,000,000 persons were «poor» in 1969 (President's Commission on Income Maintenance, 1969). This technique also reveals that during «the 1960s the number of poor persons decreased sharply: from 1960 through 1969, the number of persons in poverty dropped from 40 million to 24 million» (Harris and Townsend, 1971:898).

Such decrease should be accompanied by greater emphasis on sociopsychological needs in the American society.

#### VI. rising sociopsychological needs

Indeed, studies in gerontology, social work, and other areas indicate that such emphasis has been intensifying for several decades (Riley and Foner, 1968:275-287; Konopka, 1963:4). According to Hamilton (1964:91), the «common stock of casework has come to include not only understanding economic social need, but the *person* who has the need. Both psychiatry and economics have taught indispensable principles of self-awareness and democratic values in 'relief' administration, as in other forms of casework.» Moreover, the social case method «individualizes the person... motivates independence, self-help, self-awareness, and responsibility in the client» and even considers his «emotional needs» (Hamilton, 1964:245-246). One's eligibility for public assistance has also increasingly incorporated sociopsychological considerations. The following quotations from Hamilton (1964:198-212) are relevant: «psychogenetic diagnosis» «to gain understanding of the growth of the personality»; about 1930, when the «stark realities of unemployment and destitution» prevailed, a «reaction against full developmental histories set in» even among professional social workers;

security «in one's culture is an essential part of self-acceptance. Because each individual uses his culture in terms of his psychological needs it is important to be sensitive to caste and class»; and today «there is reemphasis upon appropriate psychogenetic history as there is support for a well-directed psychosocial study.» More significantly, even when the form of public assistance is economic aid directed at physiological needs, the new approach in our affluent society stresses unrestricted money payments, personal dignity, sociopsychological counseling, and «support of the ego philosophically and technically,» namely, an effort to diminish the social stigma that accompanies public relief (Hamilton, 1964:87-88).

It is interesting to add that the now prosperous working classes have finally become keenly aware of nonphysical needs and even demanded that these needs be met as extensively as possible. In 1965, for instance, it was stated, with reference to the United Auto Workers, that collective «bargaining is making the psychiatrist's couch available to persons with mental and emotional problems without regard to their ability to pay the cost of such care—which often is expensive» (Clawson, 1965). This was «the first nationally negotiated psychiatric care insurance plan reached through the collective bargaining process» (Clawson, 1965). Some of the numerous corporations that agreed to pay the cost of mental health insurance for the employees and their families were Allis Chalmers, American Motors, Caterpillar, Chrysler, Ford, General Motors, International Harvester, and John Deere. One of the originators of this unusual proposal was Melvin Glasser, a former dean at Brandeis University, who said, «Mental health care is the greatest unmet health need of workers today» (Clawson, 1965). Naturally, unlike the American Medical Association, which opposed Medicare, the American Psychiatric Association supported and even helped formulate the United Auto Workers' plan. In fact, Dr. Daniel Blain, the president of the psychiatric association, wrote to President Walter Reuther: «We have in these contracts, beyond a doubt, a real breakthrough in putting the national struggle against mental illness on a sound footing. I pledge the cooperation of our association in making these new plans succeed» (Clawson, 1965).

When these changes are compared with family needs and social work in the less affluent developing countries of Africa and the rest of the Third World, as one would expect, we find that main emphasis is still being placed on purely economic problems, nutrition, hygiene, physical health, and the like. The tendency to deemphasize humiliating charity and to train social workers in more modern techniques is still somewhat rudimentary (Nérot and Mis-

ké, 1972; Iliovici, 1972; Sicault, 1972; cf. Skórzynski, 1971; Heraud, 1970).

## VII. New York's needy families

So far, the above mentioned illustrations, which are primarily megascopic or macroanalytical, tend to support the theory concerning the inverse relationship between physiological and sociopsychological human needs. It is now necessary to examine the theory through some microscopic or microanalytical data.

One of the tests designed for this purpose was based on the changing needs of the families of a major American city, namely, New York.

### A. Methodology

The population of the study consisted of New York's needy families that had been described in the *New York Times* during the month of December in each year. An example of such a case is given below (*New York Times*, December 7, 1952, II, p. 3, Case 65):

#### «Fatally Ill

“Mrs. Dorothy R., 26, has a progressive nerve disease which is incurable and is expected soon to be fatal. She staggers when she walks and is losing the ability to grasp things with her hands. Her husband, Max, 27, a waiter, has been taking time off to help with the housework and the care of Celia, 4. But he is so alarmed about his wife and Celia, who suffers from allergies, that he has developed ulcers.

“He appealed to the agency recently because the family savings, used to supplement his curtailed earnings, were exhausted. To make ends meet he had to resume full-time work and he could not afford outside help.

“Homemaker service, for which funds are urgently needed, will not be a permanent solution, but it will relieve the strain on the R.'s and allow them a breathing spell in which they can plan with the counselor for Celia's care and the time when Mr. R. will have to be both mother and father to her.»

In order to have a sufficiently long and economically heterogeneous period of time for the test of the theory, the chronological limits 1928 and 1952 were selected. Moreover, two 12-year intervals were chosen, thus giving us the needy families described in 1928, 1940, and 1952. For the sake of uniformity, the sample included the first December group of 100 cases that appeared in the *New York Times* in each of these years. From the resulting group of 300 needy families, 150 cases were selected at random—50 from each year—the final sample thus consisting

of 50 items from 1928, 50 from 1940, and 50 from 1952.

The content analysis that followed explored four aspects of these cases:

1. *Family problems.* This refers to the family crises that, as stated in the *New York Times*, generated the needs for which some form of assistance was solicited. Of course, in many cases two or more problems were mentioned.

2. *Family needs.* Again, this represents the specific needs presented in the *New York Times* as the reasons for which help was sought. Many families were described as having two or more needs at the same time.

3. *Presentation of cases.* An effort was made to distinguish between «*subjectively*» and «*objectively*» presented cases. The former merely refers to more or less emotional descriptions that contained value judgments, strong adjectives, sentimental expressions, and the like. The latter means direct, straightforward, realistic, matter-of-fact statements of family problems and needs. To strengthen this classification, the writer supplemented his judgment with those of five judges, namely, a Catholic priest, a rabbi, a Protestant minister, and two graduate students, one in psychology and the other in sociology. Some disagreement regarding this classification arose with reference to only seven cases. Additional discussion among the judges, however, revealed that their disagreement was not substantial.

4. *Religious affiliation of agencies.* This variable was included in order to explore the possible relationship between the religious affiliation of the attesting agencies and the subjective or objective presentation of their respective cases.

The above four variables were then employed to test the following four hypotheses for the period between 1928 and 1952:

1. Family problems are increasingly becoming sociopsychological.

2. Family needs are increasingly becoming sociopsychological.

3. Needy families are being increasingly described more objectively.

4. In the past, Catholic agencies tended to describe their cases more subjectively than non-Catholic agencies did.

## B. Findings

*Hypothesis 1. Family problems are increasingly becoming sociopsychological.*

Between 1928 and 1952, the distribution of family problems was as follows (the reader should remember that some families had more than one problem at

the same time, and that, since the sample contained 50 cases from each year, the family percentages given are always twice as high as the corresponding absolute numbers of families that had the problems mentioned):

| Problem              | 1928 % | 1940 % | 1952 % |
|----------------------|--------|--------|--------|
| Alcoholism           | 6      | 2      | 8      |
| Business failure     | 0      | 6      | 4      |
| Conflict in marriage | 4      | 2      | 20     |
| Death                | 14     | 16     | 16     |
| Desertion            | 18     | 16     | 20     |
| Homelessness         | 0      | 4      | 0      |
| Illegitimacy         | 0      | 0      | 6      |
| Mental illness       | 8      | 12     | 28     |
| Neglect              | 6      | 0      | 2      |
| Old age              | 32     | 22     | 18     |
| Physical illness     | 80     | 74     | 64     |
| Separation           | 0      | 4      | 2      |
| Starvation           | 10     | 2      | 0      |
| Suicide              | 2      | 0      | 2      |
| Unemployment         | 4      | 10     | 2      |

These data, which are self-explanatory, support the hypothesis. Indeed, the problems presenting the most dramatic changes indicate that, for reasons already mentioned, sociopsychological family crises are becoming more common at the expense of physical ones.

*Hypothesis 2. Family needs are increasingly becoming sociopsychological.*

Also self-explanatory are the following figures, which reveal that our increasing affluence is gradually leading to greater emphasis on sociopsychological needs, thus corroborating the second hypothesis:

| Need                  | 1928 % | 1940 % | 1952 % |
|-----------------------|--------|--------|--------|
| Clothing              | 22     | 32     | 6      |
| Food                  | 76     | 42     | 2      |
| Furniture             | 0      | 2      | 0      |
| Guidance              | 0      | 14     | 82     |
| Heat                  | 0      | 4      | 0      |
| Homemaking service    | 0      | 2      | 16     |
| Institutionalization  | 0      | 0      | 4      |
| Medical treatment     | 58     | 30     | 8      |
| Psychiatric treatment | 0      | 2      | 10     |
| Shelter               | 20     | 30     | 10     |
| Training              | 8      | 30     | 8      |
| Miscellaneous         | 22     | 42     | 14     |

*Hypothesis 3. Needy families are being increasingly described more objectively.*

The percentages of families presented subjectively or objectively by the attesting agencies have been changing consistently, with objectivity constantly gaining ground. Below are the relevant values:

| Description | 1928 % | 1940 % | 1952 % |
|-------------|--------|--------|--------|
| Subjective  | 100    | 52     | 0      |
| Objective   | 0      | 48     | 100    |

*Hypothesis 4. In the past, Catholic agencies tended to describe their cases more subjectively than non-Catholic agencies did.*

The last hypothesis was also supported, since, as the following data suggest, although all attesting agencies have become objective in this sphere, Catholic ones were more subjective in the past, the order from most subjective to most objective being Catholic, nondenominational, and Jewish:

| Religion          | 1928 %               |     | 1940 %                 |      |
|-------------------|----------------------|-----|------------------------|------|
|                   | Subjective-Objective |     | Subjective - Objective |      |
| Catholic          | 100                  | 0   | 78.6                   | 21.4 |
| Jewish            | 100                  | 0   | 15.4                   | 84.6 |
| Nondenominational | 100                  | 0   | 56.5                   | 43.5 |
|                   | 1952 %               |     |                        |      |
|                   | Subjective-Objective |     |                        |      |
| Catholic          | 0                    | 100 |                        |      |
| Jewish            | 0                    | 100 |                        |      |
| Nondenominational | 0                    | 100 |                        |      |

### VIII. summary and conclusion

The theory presented in this study is that, as science and technology advance and the resulting affluence generates higher levels of satisfaction for man's physiological drives, our emphasis on sociopsychological needs becomes greater and greater. The data employed to test this theory were of two types: one, macroanalytical or historical, and two, microanalytical or semihistorical, the latter being the problems and needs of New York's «neediest» families. At least the data included here do support the theory.

The numerous implications of these findings are obvious. Below are a few of them:

1. We need a standardized and more precise and systematic nomenclature of human needs in order to study them more fruitfully.
2. Our increasing affluence necessitates further research into the psychology and sociology of leisure time.
3. More meaningful education in this sector is also necessary.
4. We must explore the exact relationship between frustration and violence.
5. Social planning in these areas is something that can no longer be postponed with impunity.
6. The developing economies of the Third World will generate new sociopsychological needs which, unless appropriate measures are taken, may result in social unrest and even violence.

7. Finally, the utopian plans of those who conceive of purely economic solutions as sufficient panaceas are simplistic and ludicrous, as they reveal their advocates' inability to understand the nature of both our physiological and sociopsychological needs. Unfortunately, although *physical satiety* is often easy to achieve, there is no answer, for instance, to this question: When does a man have *enough power*? For man's sociopsychological needs are insatiable, boundless, unfathomable!

### ADDENDUM

This theory may be called the *kinetic - potential theory of human needs*. The relationship is roughly approximated by the following formula:

$$PN + SPN = C$$

Here PN represents physical needs, SPN sociopsychological needs, and C a constant quantity of human needs.

The idea has been borrowed from physics, where Bernoulli's principle states that, in a moving fluid, although kinetic and potential energy may change, their sum always remains the same.

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«Everything which undergoes a change is changed from that which is an entity in potentiality into that which is an entity in act.»

Aristotle, *Metaphysics* — 11.2.1069b 15-16

«Changes are four in number: either according to quiddity, or quality, or quantity, or to place where; simple generation and corruption according to quiddity; increase and diminution according to quantity; alteration according to quality; motion according to place.»

Aristotle, *Metaphysics* — 11.2.1069b 9-13  
From the Bekker edition of Aristotle's works.